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The Effect of Intelligence, Leg Muscle Strength, and Balance Towards The Learning Outcomes of Pencak Silat Empty- Handed Single Artistic

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Abstract. This study aims to Determine the effect of intelligence, leg muscle strength, as well as the balance towards the learning outcomes of pencak silat empty-handed single artistic on the Physical Education students of Islamic University 45 Bekasi. The research method is a survey, and the analysis technique is path analysis. This research held in Islamic University 45 Bekasi with 122 people of population. The sampling technique used is random sampling, then a sample of this research is 60 people. The instruments used are a rubric 4 scale (very good, good, enough and less) of the learning outcomes of pencak silat empty-handed single artistic, intelligence test with IST (Intelligent Structure Test), leg muscle strength with instrument squat test, and test of balance by using the modified bass test of dynamic balance. Based the result of the data processing and analysis, the Conclusions are: (1) Intelligence directly effect on the learning outcomes of pencak silat empty-handed single artistic with $py_1 = 0.359$, (2) Leg muscles strength directly effect on the learning outcomes of pencak silat empty-handed single artistic with $py_2 = 0.228$, (3) Balance directly effect on the learning outcomes of pencak silat empty-handed single artistic with $py_3 = 0.356$, (4) Intelligence directly effects on the balance with $p_{31} = 0.662$, and (5) Leg muscle strength directly effects on the balance with $p_{32} = 0.298$.

Keywords: Intelligence; Leg Muscle Strength; balance; Learning Outcomes of Empty-Handed Single Artistic; Pencak Silat

I. INTRODUCTION

Pencak silat is the original culture of Indonesia and at present continues to grow, both in

the regulation and organization. A Martial arts organization in Indonesia called Indonesian Pencak Silat Association, abbreviated IPSI initiated by Mr. Wongsonegoro and inaugurated on May 18, 1948 in

Surakarta with the aim to unite and foster the whole school of pencak silats in Indonesia.

Efforts to promote and development of pencak silat are offered through various pathways, one of which is through formal education from primary school to college. In the Faculty of Education, Islamic University 45 Bekasi, coaching sport pencak silat do inside and outside the lecture hours. In the curriculum, pencak silat in charge as one of the compulsory subjects in the Bohemian community (MBB), while sports coaching activities conducted outside lecture hours more familiar with student activity units (Unit Kegiatan Mahasiswa).

The substance of the course theory practice pencak silats are designed with orientation and skill mastery learning approach. Learning is developed in this course consists of history, basic techniques, pencak silat (single artistic) and pencak silat sports (fighting). Pencak silat courses in the Faculty of Education University of Islam 45 Bekasi intended to equip students as candidates for the faculty to have the competence to teach pencak silats in school or community.

One of the skills that must be mastered by students is the pencak silat empty-handed single artistic is a series of complex motion and consists of 7 moves to the 48 series of motion and motion put forward several elements, including attitude, offensive, protection, defense, and fallout.

In a single moment studying pencak silat empty-handed single artistic, students are required to have good physical fitness components. Allegedly the physical fitness component is the leg muscle strength and balance as they both strongly support the movement, in order to attain the truth of motion and stability of motion in a single moment assessment of the pencak silat empty-handed single artistic

In addition to the components of physical fitness, intelligence factors are also thought to influence student pencak silat empty-handed single artistic. This has to do with one's ability as measured in tests of intelligence, the ability to recall (memory) for a series of moves that quite a lot and requires a good memory.

The problems that arise in the course of pencak silat is bad result to the learning outcomes pencak silat empty-handed single artistic. This is presumably due to several aspects that affect, among others: leg muscle strength, balance, and intelligence. Lower leg muscle strength possessed students expected to result in unstable balance and reduce the stability of motion. While lower intelligence is suspected will lead to error

motion sequences and pencak silat empty-handed single artistic.

The learning result is the ability of learners after receiving experience during the learning process. According to Bloom's theory, learning outcomes are divided into three domains, namely cognitive, affective and psychomotor. In this study, the learning outcomes to be assessed is the result of a single moment to learn pencak silats. According to Johansyah (2014) , a pencak silat single artistic is a series of complex motion and consists of a wide range of motion and stance, both empty hand and weapons. In the resulting National Conference (National Conference) IPSI XII explained that in a single category match, raw single moment consists of 7 empty-handed tactics, weapons stance cleaver (golok) 3, and 4 moves stick (toya) weapon, with a time of 3-minute appearance.

Learning outcomes pencak silat empty-handed single artistic in this research is the students ability to perform tricks single raw empty hand pencak silat consisting of 7 moves with 48 core motion and 6 intervals, and an element of movement attitude, attack, protection, defense, and fallout.

In addition to the necessary factor in good physical condition, it is also necessary intelligence related to cognition in the perspective of information processing, concept formation, memory, and perception. This is due to the ability to recall information or memorize the movement of a single moment has been previously learned.

Intelligence is an abstract concept that is difficult to define satisfactorily. Wechsler in Sunaryo (2014) argues that intelligence is the ability to adapt, while according to Stenberg in Zubaidi (2009), intelligence is a mental capacity of individuals to process the information automatically and to emit the proper behavior in response to something that is new, involves meta component, component performance-component, and components. Knowledge-acquisition

While the physical condition factors are also needed to support the movement in a single artistic empty-handed practice pencak silats, the physical condition of the main elements is the leg muscle strength. According to Bempa (2009), the strength is maximal (maximal force) or torque (rotational force) produced by muscle or group of muscles. Meanwhile, according to Widiastuti (2015), physiologically muscle strength is the ability of a muscle or group of muscles to perform one maximal contraction against resistance or load. According to Tangkudung (2009), the strength of the type of power / biggest power generated by a muscle to contract did not specify how fast a movement is done or how long the movement can be forwarded.

According to Badriah (2015), physiological factors affecting muscle strength are: (a) Age, until the age of 12 years an increase in muscle strength caused by an increase in muscle size, in men and women alike, (b) Gender, pelvic floor muscle strength woman 80% of muscle strength of men, and the strength of the arm muscles of women is only 55% of the strength of the muscles of the arms of a man, (c) The temperature of the muscles, muscle contraction will be stronger and faster when the temperature of the muscles slightly higher than the temperature normal. Meanwhile, according to Bompa [4], the factors that affect the strength is: (1) the number of motor units involved / recruitment, (2) the number of motor units are stimulated (rate coding), (3) the number of motor unit synchronization, (4) on the stretch-shortening cycle, (5) the degree of inhibition neuromuscular, (6) the type of muscle fibers, and (7) the degree of muscle hypertrophy.

In this study, the authors make restrictions that affect the strength of a learning outcomes of pencak silat empty-handed single artistic in leg muscle strength, the ability of a group to do the leg muscle contraction or tension to the maximum.

In addition to strength, physical condition other factors which contributed to demonstrate the truth of motion in a pencak silat empty-handed single artistic is a balance. According to Widiastuti (2015). the balance of a person's ability to maintain the attitude and position of the body quickly upon standing (static balance) or at the time of the motion (dynamic balance).

Furthermore, Magill (2011) says that the static equilibrium is the maintenance of balance, although not moving as standing, sitting or kneeling. While the dynamic balance is maintaining balance while moving such as when while walking or running. The ability to maintain a balance influenced by visual and vestibular.

The balance is a complex interaction of integration/interaction sensory system (vestibular, visual and somatosensory including proprioceptor) and musculoskeletal (muscles, joints, and finger other software) are modified/regulated in the brain (motor control, sensory, Basal ganglia, cerebellum, association area) in response to changing conditions. Internal and external, if one system is impaired, there will be disturbances in the body balance (imbalance).

Based on the above, it is necessary to do in-depth research on the influence of intelligence, leg muscle strength and balance to the learning outcomes of pencak silat empty-handed single artistic. The exogenous variables (independent variables) in this study is the intelligence and leg muscle strength by

intervening variables balance and the learning outcomes of pencak silat empty-handed single artistic serve as an endogenous variable (the dependent variable).

II. RESEARCH METHOD

The research method used in this research is survey method with measurement and test. Analysis technique used is path analysis. According to Kadir (2015) used path analysis techniques to study the causal relationship between independent variables and the dependent variable.

The research was conducted at the Islamic University 45 Bekasi, Jl. Cut Meutia No. 83 Bekasi. The population in this study were students of Physical Education Islamic University 45 Bekasi, amounting to 122 people. The sampling technique in this research using random sampling, the sample in this study amounted to 60 people.

The instrument used in this study is an assessment rubric 4 scale (excellent, good, fair and less) on the assessment of the learning outcomes of pencak silat empty-handed single artistic, intelligence tests were measured using instruments test IST (Intelligent Structural Test), leg muscle strength was measured using squat test while the balance test instrument using a modified bass test of dynamic balance.

III. RESULT AND DISCUSSION

Samples students of Physical Education in Islamic University 45 Bekasi. For descriptive statistical calculation results can be seen in the table below:

Table I
Count Results in Descriptive statistics

Descriptive Statistics							
	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
The Learning Outcomes of Pencak Silat Empty-Handed Single Artistic	60	486	309	795	580.82	110.288	12163.373
Intelligence	60	37	76	113	92.05	7.606	57.845
Leg Muscle Strength	60	105	51	156	101.75	24.413	595.987
Balance	60	35	15	50	37.50	8.806	77.542
Valid (listwise)	N	60					

Before calculating the coefficient of the line, it must be done the test requirements analysis, namely: normality test, linearity and significance of

the regression equation and correlation test. The summary results of the prerequisite test analysis:

Normality Test

Results of the calculations can be seen in Table II below:

Table II
Results of Normality test the Kolmogorov-Smirnov

	Tests of Normality					
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Intelligence	.110	60	.066	.972	60	.186
Leg Muscle Strength	.068	60	.200*	.981	60	.473
Balance	.112	60	.060	.936	60	.004
The Learning Outcomes of Pencak Silat Empty-Handed Single Artistic	.108	60	.080	.968	60	.111

a. Lilliefors Significance Correction

The table test above results can be seen in the column Kolmogorov-Smirnov. It is known that significant value to the intelligence of 0,066, leg muscle strength of 0.200, 0.060 and the balance amounting to learning outcomes of pencak silat empty-handed single artistic to be 0.080. Because of the significance for all variables more than α (0.05), it can be concluded that the overall study variables with normal distribution.

Linearity test and regression equation Significance

The test results linearity and the significance of the regression equation to 4 variables of the study, the results can be seen in the summary table below:

Table III
Summary Significance Tests and Test Results Linearity Regression

Regression	Equation	Linearity Test		Significance Test		Conclusion
		F statistic	p-value	F statistic	p-value	
Y atas X ₁	$\hat{Y} = .467,827 + 11,392X$	1,535	0,124	93,511	0,000	Linier/Significant
Y atas X ₂	$\hat{Y} = 270,843 + 3,046X$	0,549	0,944	48,372	0,000	Linier/Significant
Y atas X ₃	$\hat{Y} = 200,878 + 10,132X$	2,072	0,073	109,828	0,000	Linier/Significant
X ₃ atas X ₁	$\hat{X}_3 = -.51,304 + 0,965X$	1,707	0,075	131,725	0,000	Linier/Significant
X ₃ atas X ₂	$\hat{X}_3 = 12,622 + 0,245X$	0,858	0,668	49,304	0,000	Linier/Significant

Based on a summary of the significance test and regression linearity test, it can be seen that the overall variable have $p\text{-value} = 0.000 < 0.05$. It means all variable in this research linear and significant.

Correlation

From the test results of correlation to 4 variables of the study, the results can be seen in the summary table below:

Table IV
Summary of Results Correlation

		Correlations			
		Intelligence	Leg Muscle Strength	Balance	The Learning Outcomes of Pencak Silat Empty-Handed Single Artistic
Intelligence	Pearson Correlation	1	.573**	.833**	.786**
	Sig. (2-tailed)		.000	.000	.000
	N	60	60	60	60
Leg Muscle Strength	Pearson Correlation	.573**	1	.678**	.674**
	Sig. (2-tailed)	.000		.000	.000
	N	60	60	60	60
Balance	Pearson Correlation	.833**	.678**	1	.809**
	Sig. (2-tailed)	.000	.000		.000
	N	60	60	60	60
The Learning Outcomes of Pencak Silat Empty-Handed Single Artistic	Pearson Correlation	.786**	.674**	.809**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	60	60	60	60

** . Correlation is significant at the 0.01 level (2-tailed).

According to the table correlations above, the sig line or $p\text{-value} = 0.000 < 0.05$ or H_0 is rejected, in other words, there is all variables research has a strong relationship. This is indicated by the Pearson correlation values above 0.50.

After the calculation of the test requirements analysis, data research is eligible and can proceed to test hypotheses using path analysis.

Hypothesis Testing

Based causal models in the form of theoretically obtained path analysis diagram and then calculated the coefficient of each track. Very important requirements that must be met is a significant correlation between variables related and connected to one another. The relationship has been demonstrated above has not concluded that the occurrence of a causal relationship between these variables. From the field data has been processed and through various tests required, then the next stage in testing models of causality is to conduct path analysis.

For data processing path analysis by Kadir (2015), the Output and interpretation of the results SPSS version 23 is as follows:

Structural I

Table V
Path Analysis Structural I

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F	df	df	Sig. F Change
1	.868*	.754	.745	4.444	.754	87.348	1	57	.000

a. Predictors: (Constant), Leg Muscle Strength, Intelligence

From the table above, the coefficient of determination (R^2) equals to 0.754. This means that 75.4% of balance (X_3) supported by the intelligence (X_1) and leg muscle strength (X_2). So the error (ϵ) = $1 - R^2 = 0.246$.

Table VI
ANOVA Structural 1

ANOVA ^b						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3449.498	2	1724.749	87.348	.000 ^a
	Residual	1125.502	57	19.746		
	Total	4575.000	59			

a. Predictors: (Constant), Leg Muscle Strength, Intelligence

b. Dependent Variable: Balance

Based on the analysis in the above table was obtained $F_o = 87.348$; $DF_1 = 2$; $DF_2 = 57$; $p\text{-value} = 0.000 < 0.05$ or H_0 is rejected. Thus, variable intelligence and leg muscle strength affects the balance, here in after:

Table VII
Coefficients Structural 1

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-44.031	7.292		-6.038	.000
	Intelligence	.767	.093	.662	8.261	.000
	Leg Muscle Strength	.108	.029	.298	3.719	.000

a. Dependent Variable: Balance

From the table coefficient in model 1, was obtained in a row are as follows:

- 1) $\rho_{31} = 0.662$; $t_0 = 8.261$, $p\text{-value} = 0.000 < 0.05$, or H_0 is rejected, which means intelligence (X_1) has a positive direct effect on the balance of (X_3).
- 2) $\rho_{32} = 0.298$; $t_0 = 3.719$, $p\text{-value} = 0.000 < 0.05$, or H_0 is rejected, which means the leg muscle strength (X_2) has a positive direct effect on the balance of (X_3).

Based on the calculation results in a structural path coefficients 1 indicates that the leg muscle strength and intelligence positive direct effect on the balance.

Structural 2

Table VIII
Structural Path Analysis 2

Model Summary							
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	Sig. F Change
1	.850 ^a	.723	.708	59.571	.723	48.742	.000

a. Predictors: (Constant), Balance, Leg Muscle Strength, Intelligence

From the above table, the coefficient of determination (R^2) of 0.723 means that 72.3% of the variability of the learning outcomes of pencak silat empty-handed single artistic (Y) is influenced by the intelligence (X_1), leg muscle strength (X_2) and balance (X_3). So the error (ϵ) = $1 - R^2 = 1 - 0.723 = 0.277$.

Table IX
Structural Anova 2

ANOVA ^b						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3449.498	2	1724.749	87.348	.000 ^a
	Residual	1125.502	57	19.746		
	Total	4575.000	59			

a. Predictors: (Constant), Balance Leg Muscle Strength, Intelligence

b. Dependent Variable: The Learning Outcomes of Pencak Silat Empty-Handed Single Artistic

Based on the analysis in the above table was obtained $F_o = 48.742$; $DF_1 = 3$; $DF_2 = 56$; $p\text{-value} = 0.000 < 0.05$ or H_0 is rejected. Thus the intelligence variable, leg muscle strength and balance simultaneously positive direct effect on the learning outcomes of pencak silat empty-handed single artistic, for more details can be learned from the table below:

Table X
Coefficients Structural 2

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-169.637	125.178		-1.355	.181
	Intelligence	5.201	1.845	.359	2.819	.007
	Leg Muscle Strength	1.028	.432	.228	2.378	.021
	Balance	4.457	1.776	.356	2.510	.015

a. Dependent Variable: The Learning Outcomes of Pencak Silat Empty-Handed Single Artistic

From the table, *coefficient* data consecutive succession:

- 1) $\rho_{y1} = 0.359$; $t_0 = 2.819$, $p\text{-value} = 0.007 < 0.05$, or H_0 is rejected, which means intelligence (X_1) a positive direct effect on the learning outcomes of pencak silat empty-handed single artistic (Y).
- 2) $\rho_{y2} = 0.228$; $t_0 = 2.378$, $p\text{-value} = 0.021 < 0.05$, or H_0 is rejected, which means the leg muscle strength (X_2) a positive direct effect on the learning outcomes of pencak silat empty-handed single artistic (Y).
- 3) $\rho_{y3} = 0.356$; $t_0 = 2.510$, $p\text{-value} = 0.015 < 0.05$, or H_0 is rejected, which means balance (X_3) a positive direct effect on the learning outcomes of pencak silat empty-handed single artistic (Y).

Based on the calculation results in a structural path coefficient 2 shows that intelligence, leg muscle strength and balance a positive direct effect on on the learning outcomes of pencak silat empty-handed single artistic. The SPSS summary hypothesis testing can be seen in the table below:

Table XI
Summary of Hypothesis Testing With SPSS

Direct Variable Influence	Path Coefficient (β_{ij})	Raw Error (sb_i)	t statistics	p-value	Conclusion
X_1 over Y (β_{Y1})	0,359	1,845	2,819	0,007	Significant
X_2 over Y (β_{Y2})	0,228	0,432	2,378	0,021	Significant
X_3 over Y (β_{Y3})	0,356	1,776	2,510	0,015	Significant
X_1 over X_3 (β_{31})	0,662	0,093	8,261	0,000	Significant
X_2 over X_3 (β_{32})	0,298	0,029	3,719	0,000	Significant

Based on the results of hypothesis testing with SPSS application, the causal empirical model X_1 , X_2 , X_3 with Y visualized as follows:

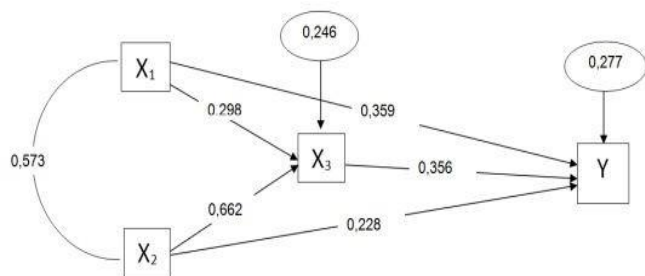


Fig. 1 Causal Model between variables X_1 , X_2 , X_3 , against Y

Intelligence as a cognitive element considered also plays an important role. Because according to Soemanto (2012), cognitive aspects related to the specific ways each individual can use in carrying out the tasks which are observation (perceptual) and intellectual. Meanwhile, according to Feldman (2012), one of the latest contributions to understanding the study of intelligence is a cognitive psychologist who uses the information processing approach. They argued that the way people store information in memory and use the information to solve the intellectual tasks that provide the most accurate measurement of intelligence. It is generally found that intelligence is a potential provision will facilitate the study and produce an optimal performance. It supported the theory that IQ tests tend to correlate with achievement tests than with grades in school.

In pencak silat empty-handed single artistic, truth movement also influenced by the intelligence. Because in practice the single artistic empty-handed pencak silat, involves the processing of information related to memory or memory. This is because there are many series of moves to be memorized, which amounted to 7 stances or motion sequence consisting of 48 movements.

Intelligence is associated with cognition in the perspective of information processing, concept formation, memory, and perception. This is due to the ability to recall information or the movement of a

single artistic has been previously learned. In this research, intelligence gives the effect of 0.359 (35.9%) on the learning outcomes of pencak silat empty-handed single artistic.

In addition to the intelligence elements of the physical condition also affects on the learning outcomes of pencak silat empty-handed single artistic, namely the leg muscle strength and balance. In studying the movement of a single moment, the function of the legs is as the support body, so that the legs of a fighter should have the power in the legs to keep the body at the time of kick and maintain balance. The level of leg muscle strength affects on the learning outcomes of pencak silat empty-handed single artistic.

In the pencak silat exercise, muscle strength used in the kicking motion is static and dynamic muscle strength, muscle sector which acts to move the body from one place to another and maintain the position of standing on one leg. Muscle contraction is used to generate an external force to move the body. Leg strength directly on the learning outcomes of pencak silat empty-handed single artistic, especially in supporting the body when one foot raised and leg strength that performs the basic techniques of horses, attacks, and the pattern of steps in a single artistic empty-handed practice pencak silat. In this study, the effect of leg muscle strength of 0.228 (22.8%) on the learning outcomes of pencak silat empty-handed single artistic.

Results of research Lee and Aronson (1974) in Edward (2011), the balance is strongly influenced by a variety of visual information presented. Taken together, the information structure of the vestibular apparatus is also important to maintain a sense of balance. Meanwhile, according to Dewi Laelatul Badriah (2009), disorders of the eye and the ear will result in a person difficult to halt or motion and difficulty in movement circuit. So it can be concluded that the balance is a stable state or to maintain weight loss center, especially when in an upright position regardless of internal or external power.

In studying and practicing tricks of pencak silat empty-handed single artistic, the element of balance is needed because a lot of movement step that requires a balance of the body, namely at the time intervals and maintain a standing position when an attack (especially kicking), a standing easel on one leg, or at the time of changing the direction of movement and do a 180°. From these results, the balancing effect for 0.356 (35.6%) on the learning outcomes of pencak silat empty-handed single artistic.

Exogenous variables also impact the other exogenous variables. In accordance with a model drawn constellations, there are two hypotheses influence between exogenous variables, namely the influence of intelligence on the balance and the effect of leg muscle strength to the balance.

The balance is a complex interaction of integration/interaction system sensory (vestibular, visual and somatosensory including proprioceptor) and musculoskeletal (muscles, joints, and finger other software) are modified/regulated in the brain (motor control, sensory, Basal ganglia, cerebellum, association area) in response to changing internal and external conditions.

According to Ibrahim (2005), someone who has a low intelligence level, it can even be categorized mild mental retardation (IQ of 69-55) tend to have a perception that is not normal and have no problems in perceptual-motor. This can occur in the form of visual perception and auditory perception, so it will affect the balance of the motion. Based on that statement, the alleged intelligence level affect balance. From these results, intelligence gives the effect of 0.662 (66.2%) against the results of the balance.

While the contribution of leg muscle strength gives the effect of 0.298 (29.8%) of the balance. The better the leg muscle strength one has, the better the balance. Based on that idea, then the leg muscle strength contributes in maintaining balance.

Leg muscle strength should be adequate to maintain the body balance when the force from the outside. Muscle strength is directly related to the ability of muscles to resist gravity and other external loads that continuously affect the position of the body.

IV. CONCLUSIONS

Based on the results of data processing and analysis, the conclusion is as follows: (1) Intelligence directly effect on the learning outcomes of pencak silat empty-handed single artistic with $\rho_{y1} = 0.359$, (2) Leg muscles strength directly effect on the learning outcomes of pencak silat empty-handed single artistic with $\rho_{y2} = 0.228$, (3) Balance directly effect on the learning outcomes of pencak silat empty-handed single artistic with $\rho_{y3} = 0.356$, (4) Intelligence directly effects on the balance with $\rho_{31} = 0.662$, and (5) Leg muscle strength directly effects on the balance with $\rho_{32} = 0.298$.

Suggestions can author to convey the outcomes of this research is for lecturers, coaches, trainers, and physical education teachers, the results of this study can be used as a reference and information on the effect of intelligence, leg muscle

strength and balance to learning outcomes of pencak silat empty-handed single artistic, so it can be used as a reference for athletes looking for talent single categories based on the level of intelligence and good physical fitness.

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